America's Seed Fund powered by the National Science Foundation

Small Business Innovation Research (SBIR)/
Small Business Technology Transfer (STTR) program
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SOLICITATION TOPICS & SUBTOPICS

America's Seed Fund powered by NSF encourages proposals in all areas of science and engineering. An exact fit into one of these topics or subtopics is not required.

For proposals due in 2021

For 40 years, America's Seed Fund powered by NSF has helped startups and small businesses transform their ideas into marketable products and services. We focus on deep technologies — those that are based on discoveries in fundamental science and engineering — and each year, we award about $200 million in funding to entrepreneurs across the country. Our goals are to support technological innovation and help create businesses and jobs in the United States. We are a congressionally mandated program — Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR).

Technology Topic Areas

- Advanced Analytics (AA)
- Advanced Manufacturing (M)
- Advanced Materials (AM)
- Artificial Intelligence (AI)
- Augmented and Virtual Reality (AV)
- Biological Technologies (BT)
- Biomedical Technologies (BM)
- Chemical Technologies (CT)
- Cloud and High-Performance Computing (CH)
- Cybersecurity and Authentication (CA)
- Digital Health (DH)
- Distributed Ledger (DL)
- Energy Technologies (EN)
- Environmental Technologies (ET)
- Human-Computer Interaction (HC)
- Instrumentation and Hardware Systems (IH)
- Internet of Things (I)
- Learning and Cognition Technologies (LC)
- Medical Devices (MD)
- Mobility (MO)
- Nanotechnology (N)
- Other Topics (OT)
- Pharmaceutical Technologies (PT)
- Photonics (PH)
- Power Management (PM)
- Quantum Information Technologies (QT)
- Robotics (R)
- Semiconductors (S)
- Space (SP)
- Wireless Technologies (W)

Advanced Analytics (AA)

The Advanced Analytics topic focuses on innovations that involve the mathematical or computational analysis of data or statistics. This topic does not include learning-based systems, which are covered under the Artificial Intelligence (AI) topic. These subtopic areas are meant to serve as examples; all proposals with technical innovation and significant commercial potential are welcome, regardless of the specific area of focus of the project.

AA1. Data Collection, Cleaning, Integration and Processing

AA2. Data Mining

AA3. Decision Modelling

AA4. Descriptive and Predictive Analytics

AA5. Deterministic Modelling

AA6. Optimization

AA7. Simulation

AA8. Statistical Modelling

AA9. Time Series Analysis and Forecasting

AA10. Visualization

AA11. Other Advanced Analytics Technologies

Advanced Manufacturing (M)

The Advanced Manufacturing topic aims to support emerging innovations in manufacturing with the potential to stimulate the nation's manufacturing sector by improving its efficiency, competitiveness, and sustainability. Proposed technology should be environmentally friendly, compatible with human health and planet health, and driven by technological advancements. Examples include, but are not limited to, innovative technologies for the processing of a variety of single-component and multi-component materials, biological and bio-inspired materials, flexible electronics, ceramics, polymers, metals, alloys, and novel composites using a variety of advanced manufacturing processes. Regenerative designs using a circular economy approach (a systemic approach to economic development designed to benefit businesses, society, and the environment) are encouraged.

M1. Additive Manufacturing Components and Systems

M2. Bio-Inspired Manufacturing

M3. Cybermanufacturing

M4. Human-Centric Industrial Technologies

M5. Infrastructure

M6. Manufacturing Technologies

M7. Modeling and Simulation

M8. Personalized Manufacturing, Maker Manufacturing, and Maker to Manufacturer

M9. Sustainable Manufacturing and Circular Economy Technologies

M10. Other Manufacturing Technologies

Advanced Materials (AM)

The Advanced Materials topic addresses the development of new and improved materials for a wide variety of commercial and industrial applications. Proposals may focus on the creation of innovative material systems and/or on critical fabrication, processing, or manufacturing challenges involved in the successful commercialization of materials. A broad range of applications areas will be considered as part of this topic.

AM1. Coatings and Surface Modifications

AM2. Materials for Sustainability

AM3. Metals and Ceramics

AM4. Novel Advanced Materials-based Sensors

AM5. Specialized Functional Materials

AM6. Structural and Infrastructural Materials

AM7. Other Advanced Materials Technologies

Artificial Intelligence (AI)

The Artificial Intelligence topic focuses on innovations in the field of artificial intelligence (AI), which refers to intelligence exhibited by machines or software. AI is not a specific technology or technical method – it is instead a field of study aimed at achieving machine-based intelligence. These subtopic areas are meant to serve as examples; all proposals with technical innovation and significant commercial potential are welcome, regardless of the specific area of focus of the project.

AI1. AI-optimized Hardware

AI2. Computer Vision

AI3. Language-based AI

AI4. Machine Learning

AI5. Other Artificial Intelligence Technologies

Augmented and Virtual Reality (AV)

The Augmented and Virtual Reality topic aims to support the early-stage development of technological innovations in the hardware, software, photonics, displays, communication processes and other enabling technologies. Additionally, innovations that bring evidence-based academic discoveries to the public sphere via augmented and virtual reality technologies are also appropriate. Since augmented and virtual reality technology is applicable to multiple industries, proposals to this topic should clearly identify target markets, potential paths to commercialization success as well as competitive analysis demonstrating the need for the proposed solution in advancing the entire field.

AV1. Audio Augmentation and Interfaces

AV2. Computation and Data integration

AV3. Projection and Display Media

AV4. Tracking, Alignment, and Stabilization Technologies

AV5. Wearable Technologies

AV6. Other Augmented and Virtual Reality Technologies

Biological Technologies (BT)

The Biological Technologies topic covers a wide range of technology areas to advance engineering and science innovation across the biological spectrum. Biological technologies have disrupted decades-old chemical, agricultural, and medical products and services, producing a new bioeconomy. Potential breakthroughs in this space are on course to make major socioeconomic contributions to the economy by boosting productivity in industrial and agricultural processes, improving human health, and making advances toward environmental sustainability.

Proposed projects should be focused on using or modifying living organisms, systems, or biological processes to develop novel technologies to produce biochemicals, medical products, and agricultural products. They may involve bioengineering to improve function in molecules, cells, and tissues in humans, plants, animals, and microbes. NSF also encourages proposals for enabling technologies, such as new tools for genomics, proteomics, and drug discovery, the development of instruments for biological applications, computational and bioinformatic tools, and new manufacturing technologies for cells, tissues, organs and biologics.

BT1. Animal Biotechnology

BT2. Bio-Inspired Technologies

BT3. Bioinstruments

BT4. Biosensors

BT5. Cell and Tissue Engineering

BT6. Computational Biology and Bioinformatics

BT7. Fermentation Technologies

BT8. Life Science Research Tools

BT9. Materials for Biomedical Applications

BT10. Plant Biotechnology

BT11. Synthetic Biology and Metabolic Engineering

BT12. Other Biological Technologies

Biomedical Technologies (BM)

The Biomedical Technologies topic aims to support the early-stage development of novel products, processes, or services that will enable the delivery of high-quality, economically-efficient healthcare.

Subtopics are not aimed at supporting or conducting clinical trials, clinical efficacy or safety studies, the development pre-clinical or clinical-stage drug candidates or medical devices, or work performed primarily for regulatory purposes. Limited studies with human subjects may be acceptable to the extent that they are performed in support of feasibility, proof-of-concept studies of early-stage technologies. **Proposals that request support for clinical studies will be deemed non-compliant with the SBIR/STTR solicitations and may be returned without review.**

BM1. Diagnostics

BM2. Medical Imaging

BM3. Monitoring Devices

BM4. Other Biomedical Technologies

Chemical Technologies (CT)

The Chemical Technologies topic covers a wide range of technology areas of current and emerging commercial significance pertaining to the broad chemical industry, food processing and technology, agrochemicals, chemical alternatives and organics, green chemicals, water treatment and separations, advanced catalysts and materials, and biochemicals. Sensing, data, and advanced analytics technologies relevant to these fields are also appropriate for this topic area. Beyond improvement on technical specifications, it is important to also clearly identify the competitive landscape of what is currently possible, and why the proposed innovation will an impact commercially and/or from a societal benefit standpoint.

CT1. Biochemicals

CT2. Catalysts, Advanced Chemicals and Materials

CT3. Chemical and Environmental Sensing and Data

CT4. Food Processing, Chemicals and Agriculture

CT5. Green Chemicals and Chemical Alternatives

CT6. Separations and Water Treatment

CT7. Other Chemical Technologies

Cloud and High-Performance Computing (CH)

The Cloud and High-Performance Computing topic focuses on innovations that result in substantial improvements to cloud computing or high-performance computing platforms. These improvements may be in terms of computing power and efficiency, energy management, data storage, latency, data integrity and availability, cost, or any other factor of importance in such platforms, and may result from software- or hardware-based innovations. These subtopic areas are meant to serve as examples; all proposals with technical innovation and significant commercial potential are welcome, regardless of the specific area of focus of the project.

CH1. Algorithms and Applications

CH2. Computational Architecture

CH3. Convergence of AI and Cloud/HPC

CH4. Edge Computing

CH5. Energy Efficiency and Sustainability

CH6. In-memory Processing

CH7. Interconnects

CH8. Middleware

CH9. Performance Monitoring

CH10. Processing on Encrypted Data

CH11. Processor Architecture and Design

CH12. Resilience and Resource Management

CH13. Other Cloud and High-Performance Computing Technologies

Cybersecurity and Authentication (CA)

The Cybersecurity and Authentication topic focuses on innovations related to the security and integrity of data and data processing, and the authentication of people and devices. These subtopic areas are meant to serve as examples; all proposals with technical innovation and significant commercial potential are welcome, regardless of the specific area of focus of the project.

CA1. Computation on Encrypted Data

CA2. Cryptography, including Post-quantum Cryptography

CA3. Data Privacy and Integrity

CA4. Device Authentication

CA5. Encryption, including Homomorphic Encryption

CA6. Network and Device Security

CA7. Personal Authentication

CA8. Secure and Trusted Computing

CA9. Secure Machine-to-Machine Communication

CA10. Security of Cloud and HPC Platforms

CA11. Other Cybersecurity and Authentication Technologies

Digital Health (DH)

The Digital Health topic aims to support the early-stage development of novel devices, components, systems, algorithms, networks, applications, or services that will enable the transformation of healthcare from reactive, hospital-centered, and indemnity-based to proactive, person-centered, preventive, and cost-efficient.

Subtopics are not aimed at supporting clinical trials, the clinical validation of information technologies, or medical devices or studies performed primarily for regulatory purposes. Limited studies with human subjects may be acceptable to the extent that they are performed in support of feasibility, proof-of-concept studies of early-stage technologies. **Proposals that request support for clinical studies will be deemed non-compliant with the SBIR/STTR solicitations and may be returned without review.**

DH1. Clinical Decision Support

DH2. Healthcare System Workflow

DH3. Medical Diagnostics

DH4. Personalized Software Systems

DH5. Other Digital Health Technologies

Distributed Ledger (DL)

The Distributed Ledger topic area covers a wide range of technology areas of current and emerging commercial significance and impact spanning all areas of distributed ledger including blockchains, Directed Acyclic Graphs (DAGs), and related capabilities (cryptography, smart contracts, etc.). Applications of these technologies and approaches across any range of industries and commercial uses are appropriate for this topic area. It is important that the proposed project involve novel, distinctive approaches and/or disruptive innovations that enable high potential impact and competitive advantage in its field of use. These subtopic areas are meant to serve as examples of what entrepreneurs may propose in this space; all distributed ledger proposals with technical innovation and significant commercial potential are welcome, regardless of the specific area of focus of the project.

DL1. Autonomous Systems and Economies, and Smart Contracts

DL2. Blockchain, DAGs, and Next-Gen Protocols

DL3. Convergence with Big Data, and Artificial Intelligence

DL4. Convergence with Internet of Things, Crowdsourcing and Crowdsensing

DL5. Cryptography, Security, and Cybersecurity

DL6. Distributed Consensus and Fault Tolerance Mechanisms

DL7. Distributed Ledger in Edge and Cloud Computing

DL8. Distributed Ledger Interoperability

DL9. Distributed Ledger in Network Architecture and Management

DL10. Financial Technologies

DL11. Human-to-Technology Interfaces and Decentralized Applications (dApps)

DL12. Scalability Solutions and Accumulators

DL13. Trusted Identity and Identity Management

DL14. Other Distributed Ledger Technologies

Energy Technologies (EN)

Proposals in the Energy Technologies topic are encouraged in the areas of new energy sources and resources, power generation, energy storage, and electronic systems for energy sources used in mobile technologies and off-grid type applications. Proposals in all areas of energy generation are welcome, with an emphasis on how the new idea competes favorably with existing solutions. Proposals in oil and gas and related processes are welcome. Proposals that focus on the intersection of energy technologies and data are welcome across all areas where integrations to energy technology, applications are the primary thrust (including computational technologies). Proposals with ideas on nature-inspired processes for sustainable energy solutions and carbon storage, reducing the carbon and resource intensity of hydrocarbon extraction, energy conversion, and its uses are also sought. Proposals involving energy storage from the scale of wearable devices to power plant, and energy conversion are encouraged.

EN1. Energy Efficiencies and Data Technologies

EN2. Energy Production and Power Generation

EN3. Energy Storage

EN4. Petrochemicals, Oil and Gas

EN5. Other Energy Technologies

Environmental Technologies (ET)

Environmental Technologies cover a range of innovations that bring the promise of sustainability, high commercial impact and/or societal and environmental benefits. The topic covers a wide range of technology areas of current and emerging commercial significance pertaining to the technologies and materials that improve environmental and or environmental health outcomes. Sensing, data, and advanced analytics technologies relevant to these fields are also appropriate. If the proposed technology or approach addresses a problem without a current solution or one which is underdeveloped, this should be highlighted.

ET1. Computational Sustainability

ET2. Digital Ecosystem for the Environment

ET3. Emission/Waste Reduction and the Circular Economy

ET4. Environmental Health

ET5. Environmental and Societal Impact Measurement

ET6. Food, Regenerative Agriculture, and Energy

ET7. Habitat Conservation, Adaptation and Restoration

ET8. Sustainable Community Systems

ET9. Water Treatment, Resilience, and Sanitation

ET10. Other Environmental Technologies

Human-Computer Interaction (HC)

The Human Computer Interaction (HC) topic aims to support the early-stage development and prototyping of unproven technologies to increase usability of high-intensity human-computer interactive tasks. Intradisciplinary approaches to sustainable products in this topic are encouraged as HCI is an intersection of multiple disciplines, including computer science, behavioral sciences, human-centered design, media studies, and several other fields of study. Subtopics include but are not limited to:

HC1. Analytics

HC2. Conversational Interfaces

HC3. Dynamic and Smart Spaces

HC4. Embodied and Wearable Computing

HC5. Optometry and Human Vision

HC6. Tactile Technologies

HC7. Technology Aids for Disabilities

HC8. Other Human-Computer Interaction Technologies

Instrumentation and Hardware Systems (IH)

The Instrumentation and Hardware Systems topic addresses the research and development of new and improved instrumentation and related systems for a wide variety of commercial and industrial applications. Proposals in this topic may deal with new instruments for use in scientific, industrial, engineering, or manufacturing environments, among others. Types of instruments that will be considered include systems and tools designed for the purposes of detection, manipulation, characterization, measurement, processing, control, and/or monitoring. A wide variety of applications areas will be considered as part of this topic.

IHI. Instrumentation or Hardware Systems for Actuation, Control, and Manipulation

IH2. Instrumentation or Hardware Systems for Detection and Characterization

IH3. Instrumentation or Hardware Systems for Imaging

IH4. Other Instrumentation or Hardware Systems Technologies

Internet of Things (I)

The Internet of Things (IoT) is a rapidly evolving field that involves the interconnection and interaction of smart objects (objects or devices with embedded sensors, onboard data processing capability, and a means of communication) to provide automated services that would otherwise not be possible. IoT is not a single technology, but rather involves the convergence of sensor, actuator, information, and communication technologies. Emerging IoT implementations will use smaller and more energy-efficient embedded sensor technologies, more sophisticated actuators, enhanced communications, and advanced data analytics to collect and aggregate information and enable intelligent systems that understand context, track and manage complex interactions, and anticipate requirements. Market verticals that are potentially impacted by innovations in this area include connected cities and homes, smart transportation, smart agriculture, industrial IoT, and retail IoT.

I1. IoT Communications

I2. IoT Integrated Systems

I3. IoT Sensors and Actuators

I4. Other IoT Technologies

Learning and Cognition Technologies (LC)

The Learning and Cognition Technologies topic aims to cover all learning and cognitive innovations that require research and development to advance the field of STEM education. This topic supports the development of a prototype or proof-of-concept and does not support curriculum development or incremental work on existing technologies. Subtopics include but are not limited to:

LC1. Asynchronous and Remote Learning

LC2. Collaborative Networking

LC3. Digital Learning

LC4. Learning Disabilities and Difficulties

LC5. Learning and Workforce Development

LC6. Learning Modalities

LC7. Mental Health Assessment and Support

LC8. Neuroscience-based Technologies

LC9. Scalable Educational Enterprise Systems

LC10. Statistical and Heuristic Analysis

LC11. Other Learning and Cognition Technologies

Medical Devices (MD)

The Medical Devices topic aims to support the early-stage development of novel products, processes, or services that will enable the delivery of high-quality, economically-efficient healthcare in the United States and globally.

The medical devices topic is not aimed at supporting or conducting clinical trials, clinical efficacy or safety studies, the development of pre-clinical or clinical-stage drug candidates or medical devices, or work performed primarily for regulatory purposes. Limited studies with human subjects may be acceptable to the extent that they are performed in support of feasibility, proof-of-concept studies of early-stage technologies. **Proposals that request support for clinical studies will be deemed non-compliant with the SBIR/STTR solicitations and may be returned without review.**

MD1. Implantables

MD2. Orthopedic

MD3. Rehabilitation Devices

MD4. Sensors

MD5. Wearables

MD6. Other Medical Devices

Mobility (MO)

The Mobility topic aims to support novel innovations in land, air, sea-based movement of goods and people. This topic supports the research and development of transformative hardware, software, and behavioral solutions in support of a resilient and sustainable future of mobility. Proposals responsive to this topic can include innovations in hardware and software, innovations to facilitate adoption of new mobility technologies, address issues in infrastructure and flow in global, urban, and rural environments. Interdisciplinary and collaborative innovations to address multiple mobility aspects are welcome. All proposed innovations must be capable of a sustainable business model.

MO1. Behavioral

MO2. Hardware

MO3. Infrastructure and Flow

MO4. Resiliency and Sustainability

MO5. Software

MO6. Other Mobility Topics

Nanotechnology (N)

The Nanotechnology topic addresses the creation and manipulation of functional materials, devices, and systems with novel properties and functions that are achieved through the control of matter at a submicroscopic scale (from a fraction of nanometer to about 100 nanometers). This includes, but is not limited to, innovative hierarchical nanostructures, nanolayered structures, nanowires, nanotubes, quantum dots, nanoparticles, nanofibers, and other nanomaterials and biomaterials and their composite structures. Proposals focusing on global technological challenges through development of innovative nanotechnologies are especially encouraged.

N1. Nanomanufacturing

N2. Nanomaterials

N3. Nanotechnology Solutions to Global Grand Challenges

N4. Other Nanotechnologies

Other Topics (OT)

For projects that do not seem to fit into one of the other technology topic areas, but still meet the NSF SBIR/STTR goals of supporting research and development of deep technology, with commercial viability and the potential to benefit society, please pick Other Topics and subtopic OT1. The program does not reject pitches/proposals based on a non-ideal choice of topic areas. The program routinely moves proposals/pitches internally among topic areas that seem to best describe the underlying technical innovation and to ensure the right program officer and reviewer panel sees the project.

OT1. Other Topics

Pharmaceutical Technologies (PT)

The Pharmaceutical Technologies topic covers a wide range of technology areas to advance the discovery, early-stage development and characterization, formulation, delivery, and/or manufacture of novel drugs, moieties, compounds, products, processes, platforms or services that will improve the selection, quality, or price of pharmaceutical and biologic therapies.

The Pharmaceutical Technologies topic is not aimed at supporting or conducting clinical trials, clinical efficacy or safety studies, the development of pre-clinical or clinical-stage drug candidates or medical devices, or work performed primarily for regulatory purposes. Limited studies with human subjects may be acceptable to the extent that they are performed in support of feasibility, proof-of-concept studies of early-stage technologies and must follow NSF policies on research on human subjects (https://www.nsf.gov/bfa/dias/policy/human.jsp). **Proposals that request support for clinical studies will be deemed non-compliant with the SBIR/STTR solicitations and may be returned without review.**

PT1. Drug Delivery Methods

PT2. Drug Discovery

PT3. Pharmaceutical and Biologic Manufacturing

PT4. Therapeutic Molecules

PT5. Other Pharmaceutical Technologies

Photonics (PH)

The Photonics topic addresses the research and development of new materials, devices, components, and systems that have the potential for revolutionary change in the optics and photonics industries. Photonic technologies can include anything generally operating in or using photons in the electromagnetic spectrum from gamma rays down to long radio waves. Examples include lasers, various light emitting diode technologies (LED, OLED, QLED), radiation detectors, photonic integrated circuits, optical systems, and novel communications technologies.

PH1. Advanced Metrology and Sensors

PH2. Advanced Optical Components and Systems

PH3. Communications, Information, and Data Storage

PH4. Lighting and Displays

PH5. Photon-based Energy Conversion

PH6. Photonic Materials

PH7. Other Photonics Technologies

Power Management (PM)

The Power Management topic address the development of novel technologies that enable new power and thermal management solutions. Innovations supported could range from device-scale breakthroughs, to embedded or standalone systems, to grid-scale technologies.

PM1. Energy Harvesting Devices and Systems

PM2. Materials and Devices for Power Electronics

PM3. Materials and Devices for Thermal Management

PM4. Novel Power and Thermal Management Sensors

PM5. Power Management Infrastructure and Smart Grid Systems

PM6. Systems for Thermal Management

PM7. Other Power Management Technologies

Quantum Information Technologies (QT)

This topic focuses on innovations in information and communications technologies that rely fundamentally on quantum mechanical properties and interactions. Typically, such innovations will involve the generation, detection, or manipulation of quantum states to provide faster, more efficient or more secure information processing and communications. Proposals may include innovations at the component, sub-system, or system level that result in substantial and usable improvements in the generation, transmission, detection, storage, or processing of information, or the security and privacy of information. Proposed innovations must offer the potential for robustness, reliability, scalability, and operation at temperatures that are practical within the constraints of the intended application. Innovations at the component and sub-system level should aim for compactness and energy efficiency, consistent with the requirements of the application.

Examples of technology innovations in the quantum computing subtopic could include qubit generation and detection; development of computational models (quantum circuits, etc.); error correction; software; hardware sub-systems and systems; and Noisy Intermediate-Scale Quantum (NISQ) computers. Examples of technology innovations in the quantum communications subtopic could include components such as sources, memories, repeaters, detectors; hardware sub-systems and systems; networks; cryptography; and key distribution.

QT1. Quantum Algorithms

QT2. Quantum Communications

QT3. Quantum Computing

QT4. Quantum Sensing and Metrology

QT5. Quantum Simulation

QT6. Other Quantum Information Technologies

Robotics (R)

Proposals addressing robot intelligence and experiential learning, particularly those in the areas of high-performance processors or hardware to provide situational awareness, and improved artificial intelligence, are welcome. Innovations in voice, obstacle and image recognition, emotional response, and hand-eye coordination are encouraged. We encourage proposals describing projects that borrow features from other animal nervous systems and include biologists, neuroscientists, and/or psychologists on their team to exploit new knowledge in the study of the brain and behavior. NSF also seeks proposals that address next-generation automation, the flexible and rapid reconfiguration of assembly lines allowing mass customization, the use of advanced control, scheduling, modularization, and decentralization with agile, mobile robotic systems that can enable the cost-effective manufacture of small lot-size products, and on-demand parts manufacturing. Proposals to support the physical and educational needs of individuals with disabilities (e.g., vision, hearing, cognitive, motor related) are sought. Robotic applications in healthcare, smart drones and drone networks are appropriate. Medical devices that provide new capabilities to doctors including surgery; robotic exoskeletons to enhance human strength; personal robots with an emphasis on human-centered end use and interaction, personal caregiving and increased autonomy; future of work; flying taxis, reverse engineer human brain, robot sense, motion, thought, and emotion; human-robot art, and robots of augmentation are welcome.

R1. Human Assistive Technologies and Bio-related Robotics

R2. Human-Machine Interfaces and Control/Architecture

R3. Robotic Applications

R4. Robotics in Agile Manufacturing, and Co-Robots

R5. Other Robotics Technologies

Semiconductors (S)

The Semiconductors topic addresses the research and development of new designs, materials, devices, and manufacturing systems that have the potential for impactful change in the semiconductor industry.

S1. Electronic Devices

S2. Electronic Materials

S3. Integrated Circuit Design

S4. Microelectronics Packaging and Systems Integration

S5. Novel Semiconductor-based Sensors

S6. Processing and Metrology Technology

S7. Other Semiconductor Technologies

Space (SP)

The Space topic will seek revolutionary technologies to be deployed outside Earth's atmosphere to enhance the commercial use of space. Technologies could include innovations that provide cheaper, safer, and more frequent products and solutions to commercial space customers. This topic particularly seeks to support growth-oriented small businesses who have not previously received significant SBIR/STTR funding and are seeking to contribute to economic growth by developing innovative technologies supporting the overall emerging space economy.

Proposals should address real capability gaps or enabling technologies for the space industry, anchored with a solid understanding of the challenges of working in space, including launch, mass and volume restrictions, radiation and thermal environment, communications and latency, power and energy, etc. NSF encourages proposals with revolutionary satellite and vehicle hardware or systems innovations involving propulsion systems, navigation systems, and energy collection and power generation systems unique to space environments, in-space manufacturing systems and services; Earth imaging and sensing; planetary (other than Earth) physical surveying, mapping, and prospecting services; extraction and processes of water and volatiles (not on Earth); search for extraterrestrial intelligence, space tourism, space weather, interplanetary habitats, and analytic algorithms based on data collected extensively from space-based systems, either alone or in combination with terrestrial systems.

SP1. Extra-terrestrial Resource Extraction

SP2. Geological and Geoclimatic Science Data Technologies

SP3. Ground Launch Sites and Satellite Operations Technologies

SP4. In-space Manufacturing Technologies

SP5. Navigation and Positioning Technologies

SP6. On-Orbit Technologies

SP7. Remote Sensing Technologies

SP8. Spacecraft Development and Manufacturing

SP9. Space Transportation and Access

SP10. Telecommunications Technologies

SP11. Other Space-related Technologies

Wireless Technologies (W)

Proposals of interest involve next-generation wireless communication technologies requiring systems with high data rates, low cost, and that support a wide variety of applications and services, while maintaining full mobility, minimum latency, and long battery life. Devices and subsystems that increase data throughput rates via cell density, increased spectrum, multiple input, multiple output (MIMO), massive MIMO, and new "antenna" concepts. NSF welcomes proposals involving modulation and demodulation techniques for signal generation and reception through spectral efficiency, noise immunity, jamming immunity, and power efficiency; radio frequency (RF) pollution: device and circuit; processing algorithms/3D spatial control; high efficiency devices such as micro-TWT, smart dust, and inductive couplers. NSF seeks proposals in the areas of spectrum-related research and development activities that improve the efficiency by which the radio spectrum is used, and the ability of all members of the public to access spectrum-related services. Mobile and automotive radar, smart solar panels, on-panel DC-AC converters, openRAN-related devices and applications, and self-testing and self-networking devices are also of interest.

W1. Wireless Devices and Components

W2. Wireless Systems

W3. Other Wireless Technologies